

## CLAIMS

1. A bobbin changer apparatus for replacing a lower thread bobbin to be mounted in a rotary hook of a sewing machine, said bobbin changer  
5 apparatus comprising:
  - a bobbin grasping device for grasping a bobbin case at a distal end of a chuck section;
  - a transfer mechanism for reciprocally transferring said bobbin grasping device between the rotary hook of the sewing machine and a bobbin stock  
10 section;
  - a first orientation change mechanism for orienting the chuck section of said bobbin grasping device toward the rotary hook of the sewing machine during transfer, by said transfer mechanism, of said bobbin grasping device toward the rotary hook; and
  - 15 a second orientation change mechanism for orienting the chuck section of said bobbin grasping device toward the bobbin stock section during transfer, by said transfer mechanism, of said bobbin grasping device toward the bobbin stock section,
  - wherein the first and second orientation change mechanisms are  
20 detachable from said transfer mechanism.
2. A bobbin changer apparatus as claimed in claim 1 wherein said transfer mechanism includes a guide section for guiding said bobbin grasping device between the rotary hook and the bobbin stock section, and a drive section for  
25 reciprocally transferring said bobbin grasping device along said guide section.
3. A bobbin changer apparatus as claimed in claim 1 wherein each of said

first and second orientation change mechanisms has a slanted cam surface,  
and

wherein said bobbin grasping device includes a cam follower in relation  
to the chuck section, and the chuck section is caused to pivot to change an  
5 orientation of the distal end by the cam follower moving along the cam  
surface.

4. A bobbin changer apparatus for replacing a lower thread bobbin to be  
mounted in a rotary hook of a sewing machine, said bobbin changer  
10 apparatus comprising:

a bobbin grasping device for grasping a bobbin case at a distal end of a  
chuck section;

a transfer mechanism for reciprocally transferring said bobbin grasping  
device between the rotary hook of the sewing machine and a bobbin stock  
15 section;

a first orientation change mechanism for orienting the chuck section of  
said bobbin grasping device toward the rotary hook of the sewing machine  
during transfer, by said transfer mechanism, of said bobbin grasping device  
toward the rotary hook; and

20 a second orientation change mechanism for orienting the chuck section  
of said bobbin grasping device toward the bobbin stock section during transfer,  
by said transfer mechanism, of said bobbin grasping device toward the bobbin  
stock section,

wherein said bobbin grasping device includes a moving body section  
25 linearly movable by said transfer mechanism, the chuck section pivotally  
supported on said moving body section, and a spring member for normally  
biasing the chuck section toward a predetermined neutral position, and

said first orientation change mechanism orients the distal end of said chuck section toward the rotary hook against a biasing force of said spring member, and said second orientation change mechanism orients the distal end of said chuck section toward the bobbin stock section against the biasing  
5 force of said spring member.

5. A bobbin changer apparatus as claimed in claim 4 wherein said spring member is a torsion spring, and a pin pivotable in response to pivoting movement of said chuck section is provided on said chuck section in  
10 engagement with the torsion spring, and

wherein, as said chuck section is caused to pivot via said first and second orientation change mechanisms, the torsion spring is displaced by the pin, otherwise, said chuck section is returned to the neutral position via the pin through the biasing force of the torsion spring.

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6. A bobbin changer apparatus as claimed in claim 4 wherein each of said first and second orientation change mechanisms has a slanted cam surface, and

wherein said bobbin grasping device includes a cam follower in relation  
20 to the chuck section, and the chuck section is caused to pivot to change an orientation of the distal end by the cam follower moving along the cam surface.

7. A bobbin changer apparatus for replacing a lower thread bobbin to be  
25 mounted in a rotary hook of a sewing machine, said bobbin changer apparatus comprising:

a bobbin grasping device for grasping a bobbin case at a distal end of a

chuck section; and

a transfer mechanism for reciprocally transferring said bobbin grasping device between the rotary hook of the sewing machine and a bobbin stock section,

5        said bobbin grasping device comprising:

        an arm-grasping claw for pulling out a bobbin case arm;

        drive means for causing said arm-grasping claw to pivot so as to pull out the bobbin case arm; and

        an arm-engaging protrusion for engaging with the bobbin case arm  
10        having been pulled out by said arm-grasping claw.

8.        A bobbin changer apparatus for a multi-head sewing machine having a plurality of machine heads, in which said bobbin changer apparatus recited in claim 1 is provided for each of rotary hooks that are provided in  
15        corresponding relation to the machine heads.

9.        A bobbin changer apparatus for a multi-head sewing machine as claimed in claim 8 wherein said transfer mechanism includes a timing belt for holding said bobbin grasping device so that the timing belt is driven to move  
20        together with said bobbin grasping device, and

        which further comprises a common drive-force transmission mechanism for transmitting a drive force of a common motor to said timing belt of said transfer mechanism of each of said bobbin changer apparatus corresponding to the machine heads.

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10.       A bobbin changer apparatus for a multi-head sewing machine as claimed in claim 8 wherein the multi-head sewing machine includes a main

sewing table, and an extension sewing table of a desired size detachably attached to the main sewing table,

said bobbin stock section is disposed adjacent to a front edge of the extension sewing table so that an interval between the rotary hook and the bobbin stock section differs depending on the size of the extension sewing table attached to the multi-head sewing machine, and

said transfer mechanism has a reciprocal traveling distance corresponding to the interval between the rotary hook and the bobbin stock section.

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11. A bobbin changer apparatus for a multi-head sewing machine as claimed in claim 10 wherein said first orientation change mechanism is disposed on the main sewing table while said second orientation change mechanism is disposed on the extension sewing table, and

15 wherein, when the extension sewing table is detached from the main sewing table, said transfer mechanism is detached from said first and second orientation change mechanisms, so that individual components can be detached into three blocks: a block associated with the main sewing table; a block associated with the extension sewing table; and a block associated with said transfer mechanism.

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12. A bobbin changer apparatus for a multi-head sewing machine having a plurality of machine heads, in which said bobbin changer apparatus recited in claim 4 is provided for each of rotary hooks that are provided in corresponding relation to the machine heads.

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13. A bobbin changer apparatus for a multi-head sewing machine as

claimed in claim 12 wherein said transfer mechanism includes a timing belt for holding said bobbin grasping device so that the timing belt is driven to move together with said bobbin grasping device, and

which further comprises a common drive-force transmission mechanism  
5 for transmitting a drive force of a common motor to said timing belt of said transfer mechanism of each of said bobbin changer apparatus corresponding to the machine heads.

14. A bobbin changer apparatus for a multi-head sewing machine as  
10 claimed in claim 8 wherein the multi-head sewing machine includes a sewing table detachable from a body of the sewing machine,

said bobbin stock section is disposed adjacent to a front edge of the detachable sewing table,

said first orientation change mechanism is disposed on the body of the  
15 sewing machine while said second orientation change mechanism is disposed on the detachable sewing table, and

wherein, when the sewing table is detached from the body of the sewing machine, said transfer mechanism is detached from said first and second orientation change mechanisms, so that individual components can be  
20 detached into three blocks: a block associated with the body of the sewing machine; a block associated with the detachable sewing table; and a block associated with said transfer mechanism.

15. A bobbin changer apparatus for replacing a lower thread bobbin to be  
25 mounted in a rotary hook of a sewing machine, said bobbin changer apparatus comprising:

a bobbin grasping device for grasping a bobbin case by means of a chuck

section;

an actuator selectively performing a grasp operation to cause the bobbin case to be grasped by the chuck section when the chuck section is empty and a release operation to release the bobbin case from the chuck section grasping  
5 the bobbin case;

a transfer mechanism for reciprocally transferring said bobbin grasping device together with said actuator between the rotary hook of the sewing machine and the bobbin stock section;

a first cam mechanism for orienting the chuck section of said bobbin  
10 grasping device toward the rotary hook of the sewing machine during transfer, by said transfer mechanism, of said bobbin grasping device toward the rotary hook; and

a second orientation change mechanism for orienting the chuck section of said bobbin grasping device toward the bobbin stock section during transfer,  
15 by said transfer mechanism, of said bobbin grasping device toward the bobbin stock section; and

means for positioning the chuck section of said bobbin grasping device in a neutral posture in a middle portion of a transfer stroke between said first cam mechanism and said second cam mechanism,

20 wherein replacement of a bobbin case having a lower thread bobbin accommodated therein is carried out by the bobbin case being taken into or released from the chuck section at a position where the chuck section contacts the rotary hook or the bobbin stock section.